1886 • 1936

Golden Jubilee *of* Alternating Current

EARLY HISTORY *of* THE BRITISH COLUMBIA ELECTRIC POWER SYSTEM IN THE LOWER MAINLAND *of* BRITISH COLUMBIA

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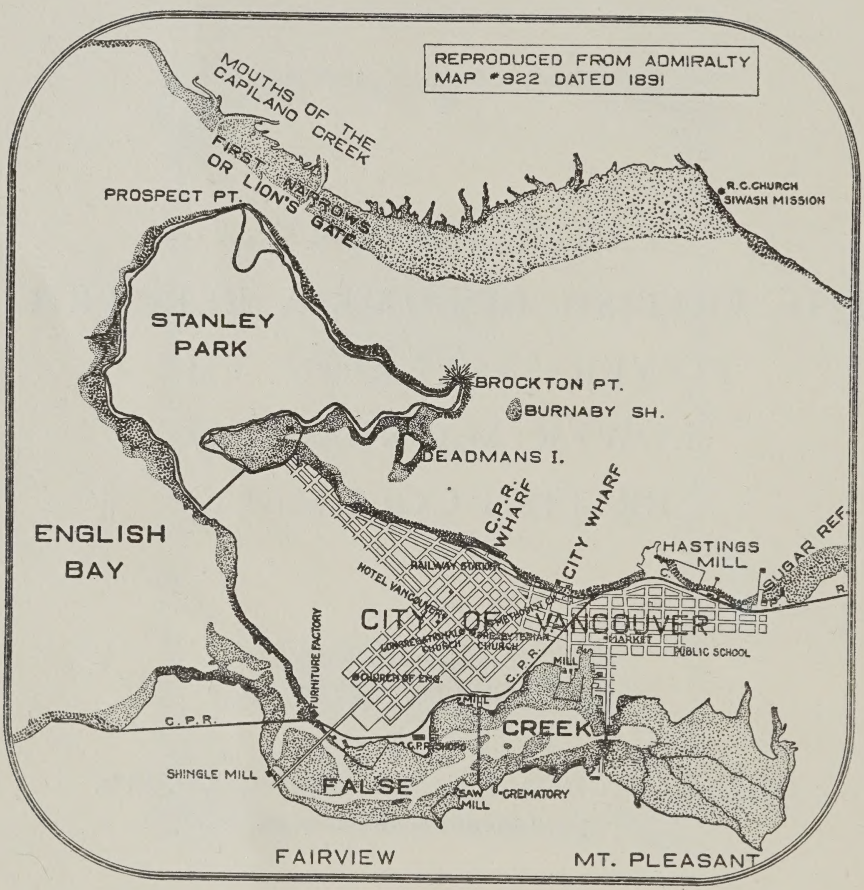
REPRODUCED FROM ADMIRALTY MAP #922 DATED 1891
MOUTHS OF THE CAPILANO CREEK
FIRST NARROWS OR LION'S GATE
PROSPECT PT.
R.C.CHURCH SIWASH MISSION
STANLEY PARK
BROCKTON PT.
BURNABY SH.
DEADMANS I.
C.P.R. WHARF
CITY WHARF
ENGLISH BAY
HASTINGS MILL
SUGAR REF.
RAILWAY STATION
HOTEL VANCOUVER
CITY OF VANCOUVER
MARKET
PUBLIC SCHOOL
FURNITURE FACTORY
C.P.R.
MILL
CREEK
SHINGLE MILL
FALSE
SAW MILL
CREMATORY
FAIRVIEW
MT. PLEASANT

Early History of The British Columbia Electric Power System in the Lower Mainland of British Columbia

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SOME time during the Fifteenth Century, a strange combination of wind and wave chanced to wash ashore on the coast of Spain or Portugal a collection of wreckage of unknown origin, including the dead body of a red-skinned Indian.

This occurrence set in motion a train of thought in the mind of a Genoese sailor, by the name of Cristoforo Colombo, and led to the discovery of a new continent.

I cite this example of a relatively small event which caused a complete revolution in the knowledge of geography and opened a new and important chapter of history.

Along the path of progress, which mankind has trod down through the ages, other events have occurred from time to time—events that in themselves have appeared accidental and insignificant, but which have engendered consequences of such moment as to exercise a profound influence on that progress.

The generation of our grandfathers saw such an event, one that led to far-reaching developments of the greatest import to all of us now living. This revelation came with startling suddenness, like a bolt out of a blue sky. One may be tempted to refer to it as a handwriting on the wall, but literally it was a sign which displayed itself on a table. It was there for all to see but none to interpret.

To us, the meaning of this sign is now partly revealed, for among other things it means that time and space here on earth have shrunk beyond belief; it means that a human voice can be heard to the far corners of the earth; it means that the

burden of toil can be lifted from the shoulders of man and beast; and it means that darkness can be dispelled by light.

The fulness of this development is by no means in sight, so it may well be that this brief interpretation is exceedingly elementary.

Our electric age thus had its small beginning in the year 1820, when an unsuspected relationship between electricity and magnetism was discovered by Professor Oersted while lecturing to a class of students at the University of Copenhagen.

While this discovery was accidental, so far as Oersted was concerned, he was nevertheless a scientist worthy of the opportunity which fate placed in his hands. To his everlasting credit, let it be recorded that he carefully noted down all the details of his discovery and published them.

He communicated the news to the various seats of learning throughout Europe, and others were soon delving into the new mystery.

At that time there lived in London an intellectual giant by the name of Michael Faraday, who was a brilliant experimenter and investigator. The genius of Faraday discovered the principle and formulated the theory of electro-magnetic induction, on which virtually all electrical development is based. He built the first dynamo, the forerunner of the modern electric generator, and presented to the world a number of other valuable contributions in the new branch of science.

There were many others—scientists, inventors, and engineers—too numerous to mention here, who contributed notably to the progress of electro-magnetic development. As a result, the subject soon ceased to be one of merely academic interest, and it entered a sphere of usefulness and service to mankind.

It is noteworthy that some of the early practical and commercial fruits of this development were born in the field of communication, such as the telegraph and the telephone.

Electric light became possible in somewhat limited application with carbon arc lamps about 1876-78, but electric lighting gained its real impulse and made its first bid for common acceptance with the development of the incandescent lamp, by Swan in England and Edison in America, about 1879-81.

Direct current was used in the early years for this and other practical applications of electricity. Up to this time, little use had been made of alternating current, and the event, of which we celebrate the fiftieth anniversary today, marks the beginning of the practical and commercial use of alternating electric current, on the principle now utilized generally in the electric light and power industry throughout the civilized world.

While direct current still has its special applications, and they are by no means unimportant, the direct current systems are now generally operated as a limited adjunct to an alternating current power supply.

Let us pause, therefore, for a moment to pay tribute to the man whose great contribution to this industry was to develop and place in service the first alternating current lighting system, the keystone of which is the constant potential transformer.

This man was William Stanley.

Closely associated with him in this development were two other brilliant young engineers, Oliver Shallenberger and Albert Schmid. While giving these men the credit for this important work, which is their due, it is fitting that a tribute should be paid also in this connection to their enthusiastic and courageous employer, George Westinghouse.

After a small but successful beginning, and despite considerable opposition from several quarters, alternating current soon advanced into greater service. It is of interest to us that the first installation of alternating current power transmission on this continent was made on the Pacific Coast.

This project utilized water power at Oregon City and transmitted electrical energy for lighting from 100 H.P. single-phase, 3000 volt, 133 cycle generators at Oregon City to Portland, 14 miles distant. There, transformers reduced the potential to 1000 volts for distribution, and again to a lower voltage suitable for lamps. This installation was made early in 1890.

Other power projects followed, one of the more spectacular installations being the first harnessing of the waters of Niagara Falls and the transmission of 22,000 volt polyphase alternating current to Buffalo, 23 miles distant, in 1896. Since then, alternating current progress has been rapid and continuous.

Returning now to the period of fifty years ago and to our own community, it is a noteworthy coincidence that the alternating current industry and the City of Vancouver were born in the same year, viz., 1886, the City being incorporated on April 6th. The population at that time is estimated at 1,000. It was in that fateful year also, on June 13th, that a great fire destroyed practically all dwellings and other buildings in the settlement which had sprung into existence here prior to that date.

Due to the indomitable spirit of the pioneers of that day, and influenced no doubt by the extension of the Canadian Pacific Railway to the City in the following year, no time was lost in replacing the ruins and in building on at an accelerated

pace. Phoenix-like, Vancouver rose out of the ashes of the earlier settlement.

It is indicative of healthy ambition and courage that, within a few months of the great fire, the first lighting utility was organized in the young city. The Vancouver Electric Illuminating Company came into existence in 1887, being authorized by by-law in January of that year to construct and operate an electric lighting system.

This Company appears to have been organized by a number of local business men. Trustees appointed by the shareholders to manage the business were: H. F. Keefer, R. Balfour, J. Boultbee, J. Miller, and B. Springer. Mr. R. R. Giltner, of Tacoma, promoted the Company. Contracts for building the power plant and distribution system were let to Mitchell, McMullen & Giltner. The installation was made under the supervision of a Mr. Nicholls, and the lights were actually turned on on August 8, 1887.

The plant was located at Pender and Abbott Streets, and is believed to have contained one boiler and two dynamos, generating direct current at 52 volts. This equipment was purchased from A. J. Lawson, Montreal. The load is stated to have comprised 300 lamps, both commercial and street lighting. The name of the first superintendent was Dame.

The News-Advertiser of January 1st, 1888, refers to the street lighting, as follows:—

> "The electric lights give a much better light than formerly, and are a great comfort to travelers after nightfall. Vancouver is the best lighted city for its size in the World."

The population of the City at that time was 5,000. At the end of 1888, it stood at 8,500, and at the end of 1889 it was 10,500.

In the early part of 1888, the Company must have entered the power field in a modest way, the News-Advertiser being the first customer supplied. In its issue of February 23, 1888, the paper says:—

> "Commencing with our issue of yesterday, the News-Advertiser is now being printed by electricity, the power being supplied by the Electric Light Co. It will doubtless be interesting to the people of Vancouver to know that this is the first paper in the Dominion to be printed in this manner."

The Vancouver Street Railways Company was organized in April, 1889, and about that time a by-law was enacted by the City Council authorizing the construction and operation of a street railway system, the cars to be moved by horses, cable, gas or electricity, at the option of the Company.

On April 27th, 1889, the Company awarded a contract for the construction of the preliminary lines in Vancouver, the whole being completed by August 15th following. The tracks were built for horse-car operation; stables were erected south of False Creek near Main Street to house the horses, and a buyer was sent to Oregon to purchase the necessary animals. The horses were nearly due to be shipped, and arrangements were almost ready for a start when, on August 9th, the directors, on the assurance of electrical contractors that satisfactory electrical equipment could then be supplied, decided to change over to electric operation.

Contracts for the necessary machinery were entered into with the Thompson-Houston Company, of Boston; electric cars were ordered from George Stevenson, of New York, and the tracks—already laid—were bonded and otherwise adapted to electric operation.

This decision necessarily caused a delay of some months, but by May, 1890, the machinery was to hand and being installed, and six electric cars had been delivered. On June 28, 1890, the system was opened for public traffic over six miles of line. The horse contract was cancelled at some loss, and the stables were suitably disposed of.

The direct current power equipment required for operating the electric street cars was installed in a new steam plant erected in the early part of 1890 at the foot of Barnard Street, now Union Street, on the site of the existing Steam Plant. Mr. Nicholls again supervised the installation for the contractors.

In May, 1890, the Vancouver Electric Illuminating Company and the Vancouver Street Railways Company were amalgamated under the name—"Vancouver Electric Railway & Light Company."

Some time after this amalgamation, power equipment for the lighting service was installed in the Barnard Street Steam Plant. The Pender Street Station was then closed down, dismantled, and the building used as a warehouse for some time.

It is presumed that this change introduced alternating current in Vancouver for the first time. From Barnard Street, this was distributed at 1000 volts by single-phase circuits, with line transformation to 50 volts for use on customers' premises. 50 volt carbon lamps, with plain base and T.H. sockets, were used at that time. For several years after this period, power services were confined to 500 volts direct current circuits, as used also for the street car operation. A further reference to the Barnard Street Steam Plant will be made later.

The next item of importance in the traction history of Vancouver was the building of the Westminster and Vancouver tramway, started on August 1st, 1890, and completed the following year, allowing the first cars to operate on October 1st, 1891.

The Vancouver end of this interurban tramway was supplied with direct current power from the Barnard Street Steam Plant, but, in view of the length of line, it was necessary to provide a power source near New Westminster.

A direct current steam plant was therefore erected near Edmonds, adjoining the site of the present Burnaby Substation. The equipment there consisted of two 200 Kw., 500 volt bi-polar Edison generators, each driven by a 250 H.P. Ideal engine 18½"x18", 220 R.P.M. This plant was in service from 1892 to May, 1905.

Unfortunately, these youthful utilities soon found themselves in financial difficulties. An economic depression, starting in 1891 and lasting several years, put a sharp check both on the inflow of population and on the development of commercial activities. Receipts from operation failed to reach the figures anticipated, and difficulties with imperfect equipment added considerably to the cost of operation. The net revenue was insufficient to meet interest charges. Drastic consequences of this condition could not be long avoided.

Disposal of the street railway and lighting property to the City of Vancouver was attempted, but without success. A proposal of sale was submitted to the ratepayers on May 30th, 1894, and was rejected. The property and assets of the Company were then bought by a new Company, the Consolidated Railway & Light Company, formed partly of local and partly of English capitalists, represented by Mr. Frank S. Barnard.

The Westminster & Vancouver Tramway Company shared a somewhat similar fate, and was sold by public auction at New Westminster in 1895, the successful bidder being Mr. Barnard, on behalf of the Consolidated Railway & Light Company.

In November, 1895, a London syndicate, headed by Mr. R. M. Horne-Payne, purchased and took over control of all the properties and assets of the Consolidated Railway & Light Company. In addition to the utilities already mentioned, the Westminster street railway and the railway and lighting systems of Victoria and district were also acquired by the new syndicate.

The Point Ellice Bridge disaster at Victoria, which occurred on May 26, 1896, forced the Company into the receiver's hands, but Mr. Horne-Payne succeeded in raising fresh capital in England and organized the British Columbia Electric Rail-

way Company, which took over the properties and assets of the Consolidated Railway Company on April 15, 1897.

Thus came into being the public utility undertaking with which we are all acquainted, and which since that time has been inseparably associated with subsequent developments in Vancouver and the Lower Mainland of British Columbia, as well as in the Victoria district of Vancouver Island.

Before taking leave of these early and interesting precursors of the existing utility, it is fitting that some further reference should be made to the power plant on Barnard Street.

Due to increasing loads, both A.C. and D.C., this plant was added to from time to time, and it eventually came to consist of a variety of dynamos driven by a number of engines, horizontal and vertical, simple and compound, condensing and non-condensing, and with different types of valve gear.

The following items are extracts from an inventory of this plant, dated 1906:—

ENGINES:

1—Ball Engine, 18 x 16, 240 R.P.M. Purchased second-hand and installed 1890. Has done hard work; ran until Fall, 1904.

1—Standard Westinghouse, 13½ x 12, 300 R.P.M. Installed in 1890. Done hard work. Been rebuilt 3 or 4 times.

1—Westinghouse Comp. Aut. Installed 1891, done hard work, twice partially wrecked prior to 1900; once in 1900, and once in 1902. Shut down April, 1904.

1—Wheelock Duplex Tandem Compd. 17 x 30 x 38, 80 R.P.M. Originally installed in Victoria, 1891, went through fire 1892, was removed to Vancouver and re-installed and ran until Spring, 1905.

1—Laurie Engine, 18 x 34 x 42, cross compound condensing, 96 R.P.M., 650 H.P. No data as to when installed.

1—Laurie Engine, 20 x 40 x 42, condensing, direct connected to 500 Kw. Westinghouse D.C. generator, 90 R.P.M. Installed in 1898 and shut down in May, 1905.

1—Laurie Engine, same size as above, direct connected to 500 Kw., G.E. 2-phase revolving field generator, 92 R.P.M. Installed in 1898 and partially wrecked in the same year. Ran until May, 1905.

ELECTRICAL EQUIPMENT

In addition to the two direct-connected generators just referred to, the following items are noted in the same inventory:—

500 Volt D.C. Generators:

1—80 Kw. (now rated at 100 Kw.) Edison Bi-polar Generator.

2—D-62, T.H. Generators.

A.C. Generators, 60 Cycles:

1—150 Kw. Westinghouse, single-phase Generator, 600 R.P.M., 1150 Volts, 130 Amps.

2—150 Kw. Monocyclic Generators, revolving armature, 600 R.P.M., 1150 Volts, 130 Amps.

1—360 Kw., C.G.E. Generator, revolving armature, 3-phase, 600 R.P.M., 1150 Volts, 181 Amps.

1—500 Kw., G.E. Generator, revolving field, 3-phase, together with exciter mounted on same shaft as fields, 1150 Volts, 252 Amps., 360 R.P.M. This machine was used six months at Charleston Exposition prior to purchase.

Arc Lighting Apparatus:

3—T.H. Arc Dynamos, Spherical Armatures, 50 lights.

2—No. 11 Brush Arc Dynamos, 125 lights, 6,250 Volts, at 9.6 Amps., 500 R.P.M.

1—Western Electric Multi-polar 100 light Arc Dynamo.

1—Western Electric Bi-polar, 500 and 575 R.P.M., 6,500 Volts.

It may be mentioned here that arc lamps were installed for street lighting as early as July, 1890, replacing the original 50 volt D.C. incandescent street lamps supplied from Pender Street.

It is of interest to note also that later on arc lighting was not confined wholly to the streets, as one circuit—designated the "Commercial Arc Circuit"—appears to have been devoted to the lighting of customers' premises, where these lent themselves to this form of illumination.

In December, 1897, the Company had 744 service meters connected to its lines, consisting of 200 Shallenbergers, 150 Duncans, and 394 Thomsons. The meter installing and testing at that time was merged with the line work and with the repairs of arc lamps, armatures, etc. These departments were housed in a room on the first floor of the Barnard Street Steam Plant, as were also the Stores department and the Company's general offices.

New offices, however, were opened at 163 Cordova Street West during 1898. Later, they were removed to an enlarged terminal building on the site of the present head office.

In the latter part of 1898, it was decided to change the distribution system from 1,000 to 2,000 volts primary, and from 50 to 100 volts secondary. This work involved the replacement of old Stanley transformers with new G.E. and Westinghouse transformers provided with necessary taps for the required voltages. It also meant changing the old T.H. sockets and lamps for Edison sockets and lamps with screw base, similar to those now in use.

New meters were also required for the 100 volt circuits. The early Shallenberger and Duncan meters were ampere-hour meters, so, to arrive at the watt-hour consumption with these, it was necessary to multiply the meter reading by the nominal voltage of the circuit.

These important alterations in the distribution system occupied several years, and the work was not completed until 1903; but there can be no doubt that the change of transformers, meters and lamps must have resulted in a greatly improved service to the customers.

Soon after the organization of the B. C. Electric Railway Company, the new management formulated plans to develop power resources on a large scale and on a more permanent basis. In 1902, actual construction work was begun on what is now known as the Coquitlam-Buntzen development.

Looked at through spectacles of that time, one is immediately impressed with the boldness and courage of this venture, which involved the driving of a long diversion tunnel to pierce the mountain range which separates Lakes Coquitlam and Beautiful, the building of a dam at the south end of Lake Coquitlam, another at the north end of Lake Beautiful, the construction of penstocks—to operate at a 400 foot head—to a water power plant to be built on the precipitous shore of the North Arm of Burrard Inlet.

Added to these features were the further problems of building and operating a 20,000 volt transmission line to Vancouver, through rough and heavily timbered territory, including a long water span at Barnet.

It reflects great credit on the management and on all concerned that this great programme was carried through so successfully, and that power from this development was transmitted to Vancouver in December, 1903.

The name "Lake Buntzen," chosen in honor of Mr. J. Buntzen, the Company's General Manager at that time, was first given to a small body of water at the north end of Lake Beautiful, created by the erection of the intake dam. It was applied also to the power plant, and eventually its use spread to the original lake. Lake Beautiful, according to Pauline Johnson, was associated with an Indian legend relating to the Flood.

The Coquitlam tunnel, begun in 1902, was not finished until 1905, and, for the first period of hydro-electric operation, only the water from the Lake Buntzen watershed was used at the power plant.

The initial installation at the power station consisted of two (2) 1,500 Kv.A., 3-phase, 200 R.P.M. generators driven by Pelton water wheels, but, owing to rapid growth in the

demand for power, these units were soon supplemented by two others of similar size and type.

This enlargement did not suffice for long, and a 5,000 Kv.A. generator unit was next installed. By this time, it became evident that the original conception of the whole project must be revised. Optimistic though the scheme had seemed originally, the plant would soon be unable to cope with the rapidly growing demand for power.

Important steps were therefore promptly taken to make it possible to utilize practically the whole of the dependable water supply of the Coquitlam watershed, through Lake Buntzen. This involved the enlargement of the existing Coquitlam tunnel to twice its original cross-section, the building of a large dam at the outfall of Lake Coquitlam, and the installation of more and larger generating units at Lake Buntzen.

Two more 5,000 Kv.A. generators, with their water wheels, were added to the original station, and, when further enlargement at the plant became impracticable, a second station, known as Lake Buntzen No. 2, was built at a nearby location and equipped with three 8,900 Kv.A. generators. Practically the whole of this programme was completed by 1914.

The entire development of the Coquitlam-Buntzen project occupied twelve years of intensely active construction. Despite almost continuous enlargement, there were periods when the system power demand outgrew the plant capacity, and the old Vancouver Steam Plant—closed down in the spring of 1905—had to be pressed into service again temporarily during the winter of 1907-1908.

Later, during the boom years of 1910-1912, steam operation on a extensive scale became necessary to meet the still rapidly increasing demand for power. The old plant, being inadequate for such service, was therefore dismantled and replaced with another—the existing installation—on the same site. The first three units of this plant were placed in service in 1910. Two more units were added in 1911 and 1912.

The enlargement of power plants referred to in the foregoing was necessitated by corresponding activities elsewhere in the Company's system during the same period. The load growth experienced was the resultant of many and varied components. Added demands for light, power and transportation naturally arose in the rapidly growing City of Vancouver, but the Company's operations were not for long confined to this city and to the Westminster-Vancouver tramway. Services were soon extended to New Westminster and to adjoining municipal areas. At New Westminster a civic lighting plant was supplied with current by the Company, in 1904.

A substation, known as Burnaby substation, was built about 1904, adjoining the Edmonds Steam Plant, and another substation was erected later at New Westminster. These stations were connected to Lake Buntzen with a direct 20,000 volt transmission line, and to Vancouver with a similar line following the route of the tramway.

In 1905, the Company leased from the Canadian Pacific Railway Company the "Vancouver and Lulu Island Railway," extending from False Creek to Steveston via Eburne (now Marpole). This railway was electrified, and a new substation, known as Lulu Island, was established.

The following year saw street cars in operation at North Vancouver, light and power service having been extended to the North Shore in 1905.

The year 1907 marked the beginning of construction on a larger project, involving the building of power circuits and an electrified railway line from New Westminster to Chilliwack. This line, with five substations, was completed and placed in service in the fall of 1910.

A branch of the Lulu Island railway line, from Eburne to New Westminster, was built by the Canadian Pacific Railway, leased to the B. C. Electric Railway Company, electrified, and placed in operation in 1909; and an additional interurban railway, known as the Burnaby Lake line, was completed in 1910. That year also saw Point Grey Substation in operation.

About 1909, a change of operating voltage was made on the main transmission line. The former arrangement of an ungrounded 20,000 volt delta system was changed to 34,600 volts with star-connected transformer windings, the neutral points being solidly grounded.

The distributing facilities in the Vancouver area, both A.C. for light and power and D.C. for traction, were centred in and radiated from a central substation built in 1904 on Main Street, adjoining the Barnard Street Steam Plant. This station was greatly enlarged and rearranged about 1913, at which time also two other substations were built, viz., on Earl's Road and on Haro Street, to relieve congestion at Main Street and to improve distribution conditions generally.

It now becomes necessary to digress for the moment to refer to the beginning of a new development, destined soon to exercise a vital influence on the progress of the B. C. Electric Railway Company. About 1911, an important competitor entered the local power field, in the form of the Western Canada Power Company. A fine water power station was built by that company at Stave Falls, the initial equipment comprising two (2) 8,825 Kv.A. generators driven by reaction turbines of the Francis type. 60,000 volt transmission

circuits to Vancouver, with suitable terminal and somewhat limited distribution facilities at this end, were built and placed in operation on January 1st, 1912.

For several years previously, growth and development in Vancouver and the surrounding territory had been exceedingly rapid. Optimism as to continued prosperity was general, but this proved to be ill-founded. After a promising start in 1912, the Western Canada Power Company soon found itself unable to secure a profitable market for more than a fraction of its available power, a serious handicap being the lack of an adequate distribution system and the heavy financial outlay incidental to building one.

The depression which succeeded the boom period, and the World War, left their serious imprint on load charts and financial statements of both companies. A contract was then entered into between them, under which power was sold in bulk by the Western Canada Power Company to the B. C. Electric Railway Company, in increasing quantities over a period of years.

The Western Canada Power Company also secured a contract for energy in bulk to be used in the City of Bellingham, but at a not very profitable rate. As a result of its difficulties, the company was obliged to change its financial structure, and emerged as the Western Power Company of Canada.

Revival of business towards the end of and following the War brought a renewed demand for additional power in and around Vancouver. The Stave Falls Plant had been enlarged in 1916, by the installation of a third generator unit, to meet contract obligations to the B. C. Electric Railway Company, but this increase did not suffice for long.

The B. C. Electric Railway Company, faced with an inevitable prospect of still greater power demands in the near future, was forced to look for a power supply beyond its contract with the Western Power Company of Canada. The Stave River was a logical source for such power, more so as the B. C. Electric Railway Company already held water rights on Alouette Lake, the best development of which would be through Stave Lake and River.

The natural solution of this problem lay in the purchase of the Western Power Company of Canada. This was accomplished during 1920, and common management of the two companies became effective on January 1st, 1921.

An early fruit of this union was the consolidation of transmission and distribution facilities of the two companies, which resulted in greatly improved service to many customers.

Another advantage was an early start on an active construction programme at Stave Falls, the first item of which

was the installation of a fourth generator unit. This was followed by extensive dam construction to increase the hydraulic operating head, the rebuilding of existing generators to provide greater capacity, and the installation of a fifth generator unit.

This programme was completed in 1925, and effected a substantial enlargement of the plant, the combined generator capacity being now 65,625 Kv.A.

Concurrently with the latter work at Stave Falls, construction was begun on the Alouette project. This work comprised the building of a dam at the south end of Alouette Lake, the driving of a diversion tunnel from a point near the north end of the Lake, to connect with a power plant on the west shore of Stave Lake. This plant was built to consist of a single 10,000 Kv.A. generator unit, and is completely automatic in operation. It was completed and placed in service in 1928.

Subsequent development of the power resources of the Stave River has taken place at a lower site, where a dam and power plant were built during 1929 and 1930. This plant, known as the Ruskin Station, contains a single 44,000 Kv.A. generator unit, with provision for the installation of a second unit of similar size at some future time. This plant was officially opened for service on November 18, 1930.

In the Vancouver area, power system enlargements since 1914 consisted of the building of Horne-Payne Substation, at which point Stave Falls and Alouette power is received into the local transmission network.

A substantial enlargement of Point Grey Substation, to serve the greatly increased distribution facilities in that district, was carried out over a period of years.

While several existing substations have been enlarged for the purpose of serving greater loads, the trend in substations has been towards smaller units with automatic control. This applies to traction as well as light and power distribution. Bodwell, Dunbar, and Fir Street are typical stations of this type, as well as numerous unattended transformer stations serving A.C. distribution only.

West Vancouver received its first light and power service in 1923, and a 34,600 volt circuit was built to Britannia during 1924, to supply power to this important mine property.

The former Burnaby Substation was completely replaced and a modern installation made in 1930 to permit of receiving Ruskin power into the local transmission network.

Throughout the Fraser Valley districts, load growths have been gradual and steady. An exception to this is the sawmill load, which has been fluctuating, transient, and, in recent years, diminishing. At Matsqui Substation, an important junc-

tion point was established when Western Power and B. C. Electric high voltage circuits were tied together after amalgamation of the two companies. The Bellingham power contract of the Western Power Company of Canada, already referred to, was terminated in 1926.

An extension from Chilliwack to Rosedale was built in 1930. This circuit was tied in with the Agassiz district, which had been served for some years with electric lighting from a small local water power installation. The local enterprise was bought by the B. C. Electric Railway Company, and, after the distribution lines had been connected to the Company's Mainland power system, the generating station was dismantled.

The story which I have presented to you here has been little more than a sketchy outline of a great development.

Electric light alone has been of such blessing and comfort to mankind, that it may well be placed in the forefront of the gifts which modern civilization has brought us. In addition, electric power in some form or other is associated with nearly every line of human endeavor, and the broad foundation on which these modern necessities rest is the electric supply undertaking.

This truly remarkable development has reached its present stage, not because a definite and distant goal was set at the start, towards which progress was aimed, but by a process of natural growth, at a rate essentially in keeping with the needs of the time.

In nature, growth is governed to some extent by external conditions, while an inner force, which we call life, provides the necessary driving power.

In the case of corporate growth, with its multitude of outward physical manifestations that arise out of planning, labor and economic struggle, we find a similar inner driving power, composed of such great spiritual forces as faith, hope, charity, courage, ambition, determination, and man's natural urge in search of knowledge and truth.

These are the great qualities, personified in our pioneers, that lie behind this great development.

It is fitting, therefore, that we should embrace all these pioneers in our thoughts and gratefully pay them tribute for the great heritage which they have left us.

May we worthily build on the foundation they laid.